



HONOLULU
LA JOLLA
MONTEREY
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SOUTHWEST FISHERIES CENTER

MONTHLY REPORT - APRIL 1978

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SOUTHWEST FISHERIES CENTER
LA JOLLA, CALIFORNIA

HONOLULU LABORATORY
LA JOLLA LABORATORY
TIBURON LABORATORY
PACIFIC ENVIRONMENTAL GROUP

MONTHLY REPORT - APRIL 1978

STATUS OF PUBLICATIONS

Published

Crumley, Bruce L. 1977. A commercial tilapia, Tilapia mossambica, hatchery for Hawaiian skipjack tuna, Katsuwonus pelamis, fishery-- cost analysis and problematical study. In Richard S. Shomura (editor), Collection of tuna baitfish papers, p. 137-148. U.S. Dep. Commer., NOAA Tech. Rep. NMFS Circ. 408.

The Hawaiian skipjack tuna fisherman spends a good part of his time catching nehu, Stolephorus purpureus, for bait instead of fishing. This paper considers pond-raised tilapia, Tilapia mossambica, as a possible alternative bait, and sets forth information about a commercial tilapia production plant. If the fishermen purchased tilapia and fished full time, their bait would cost less than it does now, since the current break-even cost to the fisherman of a bucket of nehu is determined to be \$30.12, while the highest cost estimate for pond-reared tilapia is \$17.56.

The catch rates for tuna when using nehu and tilapia as bait were studied, and found to be comparable. Tilapia still need extensive trials as a bait species, however, and tilapia data need further scrutiny.

Tilapia characteristics, both favorable and unfavorable, are discussed and should offer some insight into the problems and advantages of raising tilapia. The possibility of sharing the tilapia tanks with a compatible, marketable species, and thereby helping to defray expenses, are also discussed.

Fish diseases contracted during three different baitfish rearing studies are reviewed, along with their treatments.

This report does not constitute publication and is for information only.

Evans, R. H. 1977. Tuna/environment programs at the Southwest Fisheries Center, La Jolla, California. In FAO Fish. Tech. Pap. 170, Environmental analyses in marine fisheries research-fisheries environmental services. Tomczak, G.H. (Ed.): 141 p.

Scientists of the SWFC, the Inter-American Tropical Tuna Commission and others have for a number of years studied the effects of the marine environment on the distribution, abundance, and availability of tropical and temperate tunas. Much of this work has been essentially descriptive. For example, compilations of catch statistics and the results of tagging experiments have been used to define distribution limits and migration patterns (Schaefer et al., 1961; Fink and Bayliff, 1970), and atmospheric and oceanic climatology has been used to describe the current structure and water mass characteristics within these limits (Sette, 1955, Owen, 1968). Also environmental variables such as wind speed, sea surface temperature, mixed layer depth, water color and dissolved oxygen content have been used as indicators of distribution and availability (Laevastu and Rosa, 1963; Blackburn, 1963; Green 1967.)

Traditionally, environmental data for fisheries research have been collected from cruises aboard research vessels. More recently these same data have been acquired from merchant ships and ships of opportunity. The latter has proved to be the more economical approach, but incoming data still tend to be sporadic in both areal and temporal coverage. SWFC researchers have moved to alleviate this problem by supplementing these traditional sources of environmental data with satellite data and data collected by tuna fishermen on the fishing grounds.

Hida, Thomas S., and James H. Uchiyama. 1977. Biology of the baitfishes Herklotsichthys punctatus and Pranesus pinguis in Majuro, Marshall Islands. In Richard S. Shomura (editor), Collection of tuna baitfish papers, p. 63-68. U.S. Dep. Commer., NOAA Tech. Rep. NMFS Circ. 408.

The results of baitfish scouting and sampling program carried out in the lagoon of Majuro Atoll, Marshall Islands, from May 1972 through April 1973 are presented in this report. The distribution and abundance, age and growth, maturity and fecundity, and stomach contents of the major baitfishes, Herklotsichthys punctatus (sardine) and Pranesus pinguis (silverside), are discussed. Adequate samples of baitfish could not be collected because of the apparent absence of suitable concentrations of the two major bait species, whose abundance fluctuated widely during the period of the observations.

Hida, Thomas S., and Jerry A. Wetherall. 1977. Estimates of the amount of nehu, Stolephorus purpureus, per bucket of bait in the Hawaiian fishery for skipjack tuna, Katsuwonus pelamis. In Richard S. Shomura (editor), Collection of tuna baitfish papers, p. 55-56. U.S. Dep. Commer., NOAA Tech. Rep. NMFS Circ. 408.

A sample survey in the Hawaiian pole-and-line fishery for skipjack tuna, Katsuwonus pelamis, showed that the average bucket of nehu, Stolephorus purpureus, the principal baitfish used in the fishery, weighs 6.4 kg (14.2 lb). This is greater than prior estimates for buckets of nehu (3.2 or 3.6 kg, 7 or 8 lb). It is not known whether the difference is due primarily to changes in bait handling practices or to inaccuracies in the early sampling and estimation procedures.

Hobson, E. S. and J. R. Chess. 1978. Trophic relationships among fishes and plankton in the lagoon at Enewetak Atoll, Marshall Islands. Fishery Bulletin 70(1):133-153.

This paper describes the effect of water currents on plankton in the lagoon of this central Pacific atoll at different times of day and night, and the impact of the resulting patterns on the distribution and behavior of the planktivorous fishes. Most diurnal planktivores are numerous where currents are strong, but relatively few where currents are weak, whereas the reverse is true of most nocturnal planktivores.

Iversen, Robert T. B., and Jay O. Puffinburger. 1977. Capture, transportation, and pumping of threadfin shad, Dorosoma petenense. In Richard S. Shomura (editor), Collection of tuna baitfish papers, p. 127-136. U.S. Dep. Commer., NOAA Tech. Rep. NMFS Circ. 408.

Methods of capturing, transporting, and acclimating threadfin shad, Dorosoma petenense, for use as live bait in skipjack tuna, Katsuwonus pelamis, fishing are described. The shad were captured in a 122-ha (302-acre) reservoir on Oahu Island, Hawaii, using a seine net either 146 or 110 m long and 7 m deep which was deployed from a skiff 6 m in length. Captured shad slowly swam to the shoreline while enclosed in a pocket of netting alongside the skiff. After being bucketed into 2,347-liter (620-gal) portable tanks, the shad were trucked 37 km to holding facilities at the Honolulu waterfront where they were acclimated to 100% seawater over a 72-h period. Up to 22,500 (40 to 70 mm long) shad in individual portable tanks have been trucked the 37 km distance with mortalities that on occasion have been less than 1%. Five experiments were conducted to determine the feasibility of pumping the shad with a centrifugal pump. Shad pumped were from 19 to 95 mm long in groups

ranging from 1,210 to 1,633 individuals. Mortalities ranged from less than 0.1% 264 h after pumping to 9.7% 25 h after pumping. Use of the centrifugal pump is recommended.

Laurs, R.M. Albacore advisory program at the Southwest Fisheries Center, La Jolla, CA. In FAO Fish. Tech. Pap. 170, Environmental analyses in marine fisheries research - fisheries environmental services: 141 p.

The National Oceanic and Atmospheric Administration, NMFS, La Jolla Laboratory (and predecessor organizations) has operated an albacore fishery forecasting/advisory services program since the early 1960's. For the past several years this program has been a sub-unit of a multidisciplinary research program on North Pacific albacore, intended to develop optimal management policy recommendations with respect to U.S. interests in North Pacific albacore fisheries and to produce information for planning and operating decisions in the U.S. albacore industry.

Shomura, Richard S. (editor). 1977. Collection of tuna baitfish papers. U.S. Dep. Commer., NOAA Tech. Rep. NMFS Circ. 408, 167. p.

Shomura, Richard S. 1977. A summary of the tuna baitfish workshop. In Richard S. Shomura (editor), Collection of tuna baitfish papers, p. 1-7. U.S. Dep. Commer., NOAA Tech. Rep. NMFS Circ. 408.

Uchida, Richard N. 1977. The fishery for nehu, Stolephorus purpureus, a live bait used for skipjack tuna, Katsuwonus pelamis, fishing in Hawaii. In Richard S. Shomura (editor), Collection of tuna baitfish papers, p. 57-62. U.S. Dep. Commer., NOAA Tech. Rep. NMFS Circ. 408.

With increasing interest in the baitfish resources and their capacity to support local skipjack tuna, Katsuwonus pelamis, fisheries, we need to evaluate their distribution and relative abundance. This paper describes the trends in production of nehu, Stolephorus purpureus, an anchovy used as live bait in the fishery for skipjack tuna in Hawaiian waters.

Kaneohe Bay and Pearl Harbor, two of the most important baiting sites in the Hawaiian Islands, produce 71% of the bait. Another important site on Oahu, particularly for night baiting, is Kalihi-Keeki Lagoon.

Day baiting produced 79% whereas night baiting produced 21% of the State's nehu catch. Catches and baiting effort showed a downward trend in the day fishery and an upward trend in the night fishery in 1961-65. In 1966-72, however, catches and baiting effort increased steadily in the day fishery whereas they declined in the night fishery.

Wetherall, Jerry A. 1977. Catch statistics and abundance of nehu, Stolephorus purpureus, in Kaneohe Bay. In Richard S. Shomura (editor), Collection of tuna baitfish papers, p. 114-118. U.S. Dep. Commer., NOAA Tech. Rep. NMFS Circ. 408.

Catch and nominal effort statistics from the Kaneohe Bay day-baiting fishery for nehu, Stolephorus purpureus, were used to explore hypotheses concerning two sources of variation in baiting success: 1) nehu stock abundance, and 2) abiotic environmental variables. Baiting success was found to be positively correlated with streamflow in a major tributary to Kaneohe Bay, but was unrelated to nominal baiting effort. However, the assumptions underpinning the analyses cannot be accepted with confidence, because the available nominal effort data do not provide a good measure of effective baiting effort. A definitive understanding of nehu stock dynamics will require changes in data collection practices of the Hawaii Division of Fish and Game. In particular, detailed information on catch per set of the bait seine and on size composition of the nehu stock and catch are needed.

Wetherall, Jerry A. 1977. Evaluation of bait substitution schemes in Hawaiian fishery for skipjack tuna, Katsuwonus pelamis. In Richard S. Shomura (editor), Collection of tuna baitfish papers, p. 160-167. U.S. Dep. Commer., NOAA Tech. Rep. NMFS Circ. 408.

A systematic procedure is presented for judging the feasibility of bait substitution schemes in the Hawaiian fishery for skipjack tuna, Katsuwonus pelamis. Over the period 1968-73, the opportunity cost of nehu, Stolephorus purpureus, the bait now in use, peaked twice a year: during the first half of July when skipjack tuna catch rates were high and during the second half of December when the ex-vessel price of skipjack tuna was high. The opportunity cost averaged \$4.78/lb, and increased by over 100% during the period, due mostly to a rise in ex-vessel price of skipjack tuna.

Feasibility of a bait substitution scheme during any season requires that unit production costs are less than opportunity costs of acquiring nehu and that the quantity of bait produced does not exceed the amount usable. Judgment of feasibility rests on some critical assumptions concerning such factors as the amount of nehu per bucket in the bait fishery, and the attractiveness of substitute baits relative to nehu. These must be substantiated through field experiments and sample surveys.

Yoshida, Howard O., Richard N. Uchida, and Tamio Otsu. 1977. The Pacific tuna pole-and-line and live-bait fisheries. In Richard S. Shomura (editor), Collection of tuna baitfish papers, p. 36-51. U.S. Dep. Commer., NOAA Tech. Rep. NMFS Circ. 408.

The pole-and-line and live-bait fisheries of the eastern, central, and western Pacific Ocean are reviewed, including landing trends of tunas and catch and effort statistics on the fisheries for the tuna baitfishes. It was estimated that landings of tuna by the live-bait, pole-and-line fisheries contributed about 35% of the total Pacific landings of tunas in 1970. Also included were gross comparisons of the relative effectiveness of the live-bait used in the various fisheries and discussions of the factors that may affect the relative effectiveness. The mean catch of tuna in metric tons per metric ton of bait was estimated at 7.5 in the eastern Pacific, 9.8 in the Japanese fishery, and 23.1 in the Hawaiian pole-and-line fishery. Thus, in terms of the catch per unit of bait, the Hawaiian fishery was 3.1 times more efficient than the eastern Pacific fishery and 2.3 times more efficient than the Japanese pole-and-line fishery.

The Japanese anchovy, Engraulis japonicus, is the most important bait species used in the Japanese pole-and-line fishery. In the eastern Pacific fishery the more important bait species are the anchoveta, Cetengraulis mysticetus; northern anchovy, E. mordax; California sardine, Sardinops caerulea; Galapagos sardine, S. sagax; and southern anchovy, E. ringens. The Hawaiian skipjack tuna fishermen primarily use nehu, Stolephorus purpureus.

Yuen, Heeny S. H. 1977. Desired characteristics of a bait for skipjack tuna, Katsuwonus pelamis. In Richard S. Shomura (editor), Collection of tuna baitfish baitfish papers, p. 52-54. U.S. Dep. Commer., NOAA Tech. Rep. NMFS Circ. 408.

Skipjack tuna, Katsuwonus pelamis, fishing in the central Pacific Ocean is largely dependent upon a limited supply of live baitfish, the nehu, Stolephorus purpureus. Experiments by the Honolulu Laboratory in a search for effective live-bait substitutes or supplements have resulted in the collection of much information on behavioral characteristics of the experimental baits. Characteristics of an effective skipjack tuna bait are: a tendency to flee towards the surface, elusiveness, a high light reflectance, a length of 2 to 6 cm, and the durability to survive in a baitwell.

Translations

Suisan Shuho (The Fishing and Food Industry Weekly). 1978. Japan's fish catches from within 200 miles of foreign countries. Suisan Shuho (The Fishing and Food Industry Weekly) 822:16-17. February 15, 1978. (Translated from Japanese by Tamio Otsu, 1978, 4 p., Translation No. 27.).

HONOLULU LABORATORY

RESOURCE ASSESSMENT AND DEVELOPMENT INVESTIGATIONS (RADI)

Economist Conducts Research for Fishery Management

Dr. Michael F. Adams, Economist in the Fishery Management Research Task at the Honolulu Laboratory, has been conducting research in support of the Western Pacific Regional Fishery Management Council's (WPRFMC) charter to prepare Fishery Management Plans (FMP).

Adams' primary concerns are first, to provide an economic profile of the fisheries under the Council's jurisdiction, and second, to conduct an economic analysis to provide empirical results relevant to the management issues. These tasks, for example, have prompted Dr. Adams to work with fishery biologists to develop an economic yield model for precious coral. He has also described for another FMP the economic characteristics of the spiny lobster fishery and market in Hawaii and how the world lobster market will influence Hawaiian fishermen and consumers in the future.

Most recently, Adams has been doing research related to the billfish FMP. Like most economic research which is aimed at supporting the public policymaker, the initial task is to summon the best available economic data and determine the relevant issues which will require economic analysis. He has summarized survey questionnaires directed at billfish recreational fishermen owning their own vessel, commercial fishermen, and charter boat firms. As part of this same effort, he has initiated a contract which provides for the collection of additional information from the same billfish user groups and from charter boat customers and fish dealers.

Fish and Fishing Activity Increase Around Aggregating Objects

Mr. Walter Matsumoto, Fishery Biologist at the Honolulu Laboratory, reported that fish and fishing activity have greatly increased around the anchored aggregating devices. He noted that the buoys are becoming extremely popular with commercial skipjack tuna boats; a week's catch of skipjack tuna in April amounted to 135,600 lb, or roughly 55% of that week's total catch, based on reported catches.

The catches at the different buoys were: 124,900 lb at buoy D, 7,800 lb at buoy C, and 2,900 lb at buoy A. The catch at buoy D does not include that made by two vessels based at Maui which fished around

the buoy but did not report their catches. The catch per vessel per day has ranged from 650 to 30,900 lb. One vessel caught 30,900, 22,300, and 6,000 lb in three day's fishing, or a total of 59,200 lb.

Word was also received that recreational trollers from Maui caught at least 3,500 lb of mahimahi and yellowfin tuna during a week in April around buoy D. The yellowfin tuna were reported to be 40-70 lb in weight.

Analysis of Spiny Lobster Catch Data Continues

James H. Uchiyama, Fishery Biologist, and Robert L. Humphreys, Jr., Research Assistant at the Honolulu Laboratory, continued their analysis of spiny lobster trapping data collected on Northwestern Hawaiian Islands (NWHI) research cruises of the Townsend Cromwell in 1976-78. The preliminary results showed that during this period, the mean catch/trap-night of spiny lobsters, both legal and shorts, varied from 0.03 at Salmon Bank to 5.19 at Maro Reef. Other banks which have yielded high catches of spiny lobsters included Necker Bank where the mean catch rate was 4.07/trap-night, Raita Bank 3.15/trap-night, and Midway Islands 2.09/trap-night.

They also found that at Necker Bank where most of the commercial fishing takes place, the catch rates for legals and shorts and for legals only have remained fairly constant after the removal of the surplus stock; however, the average size of legals showed a decreasing trend. Moreover, the fishing effort at Necker Bank has affected neither the ratio of legals to shorts nor that of males to females in the catch. The results indicated that berried females were available throughout the year at Necker and that the percentage of berried females in the catch rose during the summer months, indicating a summer spawning peak. At Midway, berried females appeared in the catch only during the summer.

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Researchers in the Insular Resources Task continued to process and analyze data collected on cruises to the NWHI. Victor Honda, Research Assistant, began examining fish catch and effort data of handline fishing operations by islands and species. Research Assistants Glenn Higashi and Darryl Tagami prepared otoliths of red snappers, Etelis marshi, and pink snappers, Pristipomoides sieboldi, for age determinations. Tagami also determined the length-weight relationship of E. marshi, initially using a linear relationship which resulted in the following:

$$W = -3.434 + 0.134 \text{ SL}, r = 0.952,$$

where W is weight in kg and SL is standard length in cm.

The standard length-fork length relationship of E. marshi was also determined, as given below:

$$FL = 0.951 + 0.899 SL, r = 0.996,$$

where FL is fork length and SL is standard length in cm.

Research Assistant Paul Shiota continued volumetric analysis of plankton samples collected at environmental stations around the NWHI.

Jose Enitan and Jeffrey Sampaga, Research Assistant, under the supervision of Uchiyama, read otoliths of pink snappers and ulua, Caranx cheilio.

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Biological Aid Robert Humphreys (April 18-21) and Research Assistant Robert B. Moffitt (March 23-April 4) served as observers on the Easy Rider's fishing trips to the NWHI. Moffitt also collected juvenile goat-fish, Parupeneus porphyreus, for experiments to determine the validity of the use of otoliths in age determination. The juveniles will be maintained in aquaria and sample over a period of time to follow the development of the lamella in the otoliths.

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Brian Joyo, Research Assistant, completed preliminary radioimmunoassay for ciguatoxin on 100 flesh and gonad samples from fish collected in the NWHI. The samples and data will be further examined and evaluated before final results on the toxicity levels of fishes are released. Joyo is working under the supervision of Dr. Y. Hokama of the University of Hawaii Biomedical Center.

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Richard Uchida, Leader, Insular Resources Task, worked on the draft FMP for Seamount Groundfish Resources and as Chairman of the Seamount Resources Planning Team, gave a briefing on the status of the draft to the Western Pacific Council's Scientific and Statistical Committee (SSC).

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Thomas Hida, Fishery Biologist, worked on the preparation of cruise and narrative reports of the recently completed cruise of the Townsend Cromwell, TC-78-01, Parts II and III.

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Dr. Robert Skillman, Coordinator, Cooperative Study of the Northwestern Hawaiian Islands, reported that the agreement for the Tripartite Cooperative Study of the NWHI has now been signed by the National Marine Fisheries Service and the U.S. Fish and Wildlife Service. Since the Hawaii Board of Land and Natural Resources voted to sign an earlier version, the signing of the final version should be a mere formality.

Estimated 1978 Hawaii Landings of Skipjack Tuna Continue Slightly Above Long-Term Average

The April 1978 Hawaii landings of skipjack tuna were estimated at 330 metric tons (MT), which is 16 MT above the landings for the same period in 1977 and 110 MT above the 1948-77 long-term average for the same period. The cumulative landings from January through April were estimated at 776 MT, which is 415 MT below last year's landings for the same period and 177 MT above the 1948-77 long-term average for the same period.

FISH-ENVIRONMENT INVESTIGATIONS (FEI)

Physiology-Behavior Experiments Continue

Dr. Andrew E. Dizon, Leader, Experimental Ecology of Tunas Task at the Honolulu Laboratory, reported on several ongoing experiments. The construction of the temperature controlled water tunnel which will be used to correlate excess body temperature with red and white muscle activity has been completed and several fish have been tested. However, all the fish died shortly after transfer to the water tunnel owing to excessive struggling. Dizon and Richard Brill, University of Hawaii graduate student, began testing several tranquilizers to reduce struggling and mortality. Azacyclonal hydrochloride and sodium pentobarbital have shown promise.

Preliminary experiments were started on kawakawa in the plastic vinyl respiration tube. Initial problem of bacterial contamination in the tube which interferes with respiration readings have been overcome. The preliminary results indicate that kawakawa and skipjack tuna have similar respiration levels at given swimming speeds.

Michael Barry, University of Hawaii graduate student, is continuing experiments on turbidity and tuna movements and is in the midst of preparing a final report on the results. In the most recent experiments, a single kawakawa is being trained to discriminate turbidity levels in an effort to determine the fish's thresholds of turbidity detection.

LA JOLLA LABORATORY

Coastal Fisheries Resources Division

LARVAL FISHES, COASTAL EAST PACIFIC PROGRAM

Detailed Study Completed on Factors
Affecting Shrinkage of Larval Fish

Fishery Biologist Gail Theilacker at the La Jolla Laboratory has nearly completed a detailed study on shrinkage of larval fish before and after preservation. In studies relating laboratory results to the field, shrinkage factors need to be determined so that larvae of the same developmental stage can be compared. Morphological differences have been reported between laboratory-reared and sea-caught larvae of the same length, and it is possible that these differences are the result of how the larvae were handled prior to preservation.

Sea-collected larvae incur mechanical damage from abrasion by the net or other plankters while the net is being towed and washed down. When damaged, delicate larvae die and shrink; this initial shrinkage at death is compounded by fixative shrinkage. The mechanical handling and fixation technique used in the laboratory is less damaging to the larvae; individual larvae are transferred by pipette to preservative and die and shrink in the preservative.

This study considered several factors that could affect shrinkage in larval fish length and other body parts: 1) species, 2) size, 3) condition (feeding or starving), 4) type of fixative, and 5) treatment of larvae before fixation (field vs. laboratory). Four larval fish species were studied: jack mackerel, Pacific mackerel, barracuda, and anchovy. The larvae, ranging in length from 3 to 14 mm, were preserved in Bouin's fixative, formalin, or alcohol. Bouin's is required for histological studies; 5% buffered formalin is the standard preservative for CalCOFI samples; and 80% ethyl alcohol is used to preserve otoliths. Larvae were preserved by either the laboratory-pipetting technique or by simulating the field method (allowing sea water to run over larvae contained in a net suspended in water for 10 minutes). Larvae were measured live and after net killing and one reported on here; preserved measurements have not yet been completed. Standard length was always measured, and for some treatments, four additional body measurements were taken (head length, eye diameter, body depth at the pectoral, and body depth at the anus).

Preliminary results indicate that percent shrinkage was independent of size (3-7 mm size class completed), species, and condition; however, there were fixative and treatment differences as outlined in the following table.

Percent Shrinkage of 4-5 mm Larvae

	<u>Standard length</u>	<u>Head length</u>	<u>Eye diameter</u>	<u>Body depth at anus</u>	<u>Body depth at pectoral</u>
Laboratory treated Bouin's fixative	8	18	10	25	25
Laboratory treated Formalin fixative	7	7	0	9	6
Net treated Formalin fixative	31	26	0	19	-
Net treated Alcohol fixative	24	22	8	18	-

The most important factor was the handling of larvae prior to preservation. It will be difficult to transfer laboratory results to the field unless these differences in shrinkage are consistent or size-related. It is interesting that the formalin-preserved eye did not shrink in either fixative treatment for this size class. Eye diameter may prove to be a good index for larval fish size.

EPA Funds UV Research for
Additional Six Months

Dr. J. Hunter reports that the manuscript, "Effect of ultraviolet irradiation on eggs and larvae of the northern anchovy, Engraulis mordax, and the Pacific mackerel, Scomber japonicus, during the embryonic stage" by Hunter, Taylor and Moser was accepted for publication by Photochemistry and Photobiology. He also reports that Environmental Protection Agency has provided sufficient monies through a contract to continue the project for six months during the latter half of this fiscal year. University of California, San Diego (UCSD) employees currently on the project under the supervision of Dr. John Taylor (UCSD) are Sandor Kaupp and Nancy Brown. They plan to extend their past work to include effects on larvae after the end of the embryonic period. Larvae will be exposed to UV radiation for 11 days at low dose levels and effects on survival, growth, and melanosome dispersion evaluated along with histopathological analysis.

Study Continues on Growth of
Anchovy Larvae in the Sea

The scope of the manuscript, "Growth of Anchovy Larvae in the Sea," by R. Methot and D. Kramer was expanded to include 4 samples from 1976 in addition to 8 samples from 1977. Methot, a graduate student at the University of California who has been in charge of this work since the death of Kramer, reports that in 5 samples the larvae were growing at the

same rate as larvae reared in the laboratory at a known temperature and on optimal ration, in 2 samples the larvae grew slower than the laboratory, and in 5 samples growth was faster. These anchovy larvae from the Southern California Bight which survived through the first feeding period apparently were not food limited.

Growth rate determinations in the preceding analysis were based on the relationship between size of individuals at the time of capture and age. Alternative measures of growth are being explored. Since otolith size is closely correlated with fish size, the width of the outermost complete daily growth increment is an estimate of the instantaneous growth rate of the fish at the time of capture. The radius of each increment in an individual's otoliths can be used to back calculate its lifetime growth history. Comparing these three measures of growth may permit determination of the magnitude of size selective avoidance of the samplers, size selective mortality, and the frequency of change in growth-limiting conditions for larval anchovy.

Recently the SWFC obtained instrumentation which will allow precise measurements of increment widths. Otoliths are viewed on a video monitor with a total magnification of 1500x. An electronic digitizer superimposes a cursor on the image of the otolith. The position of the cursor is controlled by a joystick and, upon command, transmitted to a microcomputer. The computer processes the signal, does a limited number of computations, and stores the data on magnetic tape. The digitizer, computer, tape drive, and other components of the system were interfaced by Jack Brown, Electronic Engineer. A data management system is being developed for rapid retrieval, processing and summarization of the data.

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Dr. R. Owen, Oceanographer at La Jolla, completed his manuscript, "Midwater microlayering of biogenic particles in ocean waters," in draft form in April. The manuscript, to be submitted to Science, describes the phenomenology of large variations on small space scales (to 20 cm) of phytoplankton and small zooplankton concentrations discovered to occur in coastal waters off Southern California. Also reported are similar variations of other biologically important materials--inorganic nutrients, plant pigments and detritus.

Rob Ando, SIO graduate student working with Dr. Owen on methods for quick assay of particle microstructure and its relation to small scale physical discontinuities, is now testing his double-beam transmissometer, which will sense both marine snow and microlayering and will differentiate between these two sources of light beam attenuation. Ando also has been working on an improved temperature recording system to work in parallel with the phytoplankton pump currently in use to define major features of chlorophyll variation in the upper 30 m along the Southern California coast. The temperature record, to be obtained

simultaneously with chlorophyll profiling, should help in exploring the relation between chlorophyll layering and stability of various layers of the water column.

* * * * *

Dr. A. Alvariño, Fishery Biologist at La Jolla, reports that she has received the first output from the computer section on the frequency and abundance of Chaetognaths, Ctenophores, and Medusae and other predacious invertebrates in the CalCOFI collections for the three contrasting years--1954 (cold), 1956 (moderate), and 1958 (warm). The objective of this work is to evaluate the relative importance of potential invertebrate predators of marine fish larvae, particularly those of the anchovy. The frequency and abundance of these predators will be related to the occurrence and abundance of anchovy larvae on a per station basis for these three years.

COMMERCIAL AND RECREATIONAL FISHERIES RESEARCH FOR MANAGEMENT

Egg and Larva Survey Cruise Plans Modified

Fishery Biologists G. Stauffer and J. Thrailkill prepared modified cruise plans for the May survey cruise of the Jordan. With the breakdown of the Humboldt, the research vessel operated by Mexico's Instituto Nacional de Pesca which had been leased to Scripps Institution of Oceanography during this CalCOFI year, the Jordan's assigned portion of the cruise pattern in May 1978 had to be modified so that the range of the central subpopulation of northern anchovy could be encompassed by one ship.

The Jordan is now scheduled to begin the survey on May 10 with the first station to be occupied off San Francisco. The ship will then proceed south to line 117. Station activities were reduced and many low priority stations, with regard to their importance for estimates of anchovy biomass, were deleted to keep the survey within 30 days. The Jordan will stop briefly at Port Hueneme and Long Beach to drop off priority samples and exchange crew. This cruise is the last of the 1978 CalCOFI cruises used in the 1978 estimate of spawning biomass of the central anchovy stock necessary for the August 1 implementation of the Pacific Fishery Management Council's management plan for the 1978-79 fishing season. Consequently, the timing and completion of sorting of the priority stations will be critical.

Dr. Stauffer has also completed preliminary cruise plans for a 1979 mini anchovy-Pacific hake egg and larva survey. The larva data from this survey will provide a timely estimate of the 1979 spawning biomass of the central anchovy stock required for determination of the quota for the 1979-80 fishing season and an index of abundance of spawning Pacific hake for 1979. The modified 7805 Jordan cruise plan was used

as the model. Four single ship cruises are planned during the five months from January to May. A maximum of 130 stations will be occupied from line 117 to line 60. Minimum station activity will be one CalCOFI bongo net two, one 10-meter bottle cast, and one XBT. As of yet, a vessel for the first cruise in January has not been identified but efforts are continuing to locate a vessel.

It is planned that a Soviet research vessel will conduct the second cruise as part of the continuing cooperative U.S.-U.S.S.R. egg and larva survey. The Jordan will conduct the third and fourth cruises. In addition, the California Department of Fish and Game research vessel, Alaska, will conduct midwater trawl surveys for spawning female anchovy to coincide with the second and third egg and larva surveys. These data will provide tests of the new direct biomass estimation procedure based on estimated daily egg production and percent of females spawning per day.

Draft of Preliminary Fishery Management Plan for Saury Completed

Dr. Stauffer completed the first draft of the Pacific saury Preliminary Management Plan. The purpose of the management plan is to manage a future foreign surface fishery on eastern Pacific saury stock off the coast of the United States in Washington, Oregon and California. The recommended optimum yield for the 200-mile fishery zones of U.S. and Canada is set at 30,000 metric tons. The total allowable catch for the U.S. Fishery Conservation Zone is 30,000 MT minus an amount assigned to Canada to be determined later. There is apparently no potential for domestic production of saury in the immediate future. The recommended time-area closures and other restrictions are nearly identical to those for the PMP foreign trawl fishery for California, Oregon and Washington. These recommendation will be re-evaluated once various reviewer comments are received.

Examination of Otoliths Shows Different Growth Patterns for Different Popula- tions of Some Rockfish Species

Fishery Biologist John MacGregor continues to examine otoliths and scales of various species of rockfish in order to determine the best method(s) for determining age. One interesting finding which has application to back calculation of rockfish lengths from otoliths is that the otolith growth is non-isometric. As the fish grows in length, the otolith length decreases relatively from roughly 6% of standard body length to about 4-1/2% for most of the species. The bocaccio has smaller otoliths than the other species of rockfish, but they also exhibit the decrease in relative length.

MacGregor reports that it appears also that there may be different otolith growth patterns for different populations of the same species of rockfish. For example, he has examined two large samples of rosy rockfish from two different localities. The rosy rockfish from Osborn Bank have smaller otoliths than those from Tanner Bank, although both samples show the decreasing trend in relative otolith length with increasing fish length. Two starry rockfish taken from Tanner Bank also had markedly larger otoliths than an assortment of starry rockfish taken along the coast.

Jack Mackerel Management Plan Team Formed;
Alec MacCall is Elected Team Chairman

With the addition of Eric Knaggs of the California Department of Fish and Game, the group responsible for producing the Anchovy Management Plan (D. Huppert, G. Stauffer of NMFS; A. MacCall and H. Frey of California Fish and Game; Ole Mathisen of the University of Washington), has now been given the responsibility for producing a Jack Mackerel Fishery Management Plan. At its first meeting on April 11, the group elected MacCall as the team chairman, and a proposal for the plan development was prepared for consideration of the Pacific Fishery Management Council. Work will begin within the next two months on a first draft which will be presented to the Council in December 1978.

ALBACORE FISHERIES PROGRAM

1977 Albacore Fishing Season
One of Poorest Since 1951

The 1977 albacore fishing season on the Pacific coast was one of the poorest in many years. Preliminary landings for the season are estimated to be approximately 11,400 metric tons, which is about one-half the 10-year average and the lowest since 1951. Albacore fishermen were plagued by a lack of fish in the Pacific Northwest; inconsistent, scattered catches along the rest of the coast; fish that wouldn't "bite," notably off California and northern Baja California; and high winds and rough seas on many days, especially off northern and central California.

Dr. Michael Laurs, Leader of the Albacore Fisheries program at the La Jolla Laboratory, believes that the scarcity of fish in the Pacific Northwest was due to a late migration of albacore from the western Pacific. Based on findings resulting from the National Marine Fisheries Service - American Fishermen's Research Foundation cooperative albacore studies, it appears that a major portion of the fish which enter the U.S. albacore fishery in Pacific Northwest waters make trans-Pacific migrations back and forth between the eastern and western Pacific, and that these fish are a separate group from those which enter the fishery off California south of about San Francisco. The latter group do not appear to migrate to and from the western Pacific. Fishery results from the Japanese pole-

and-line albacore fishery and from two U.S. jigboats operating in the western Pacific during May to August indicate that in 1977 albacore were late in their emigration from the western North Pacific. Dr. Laurs further speculates that the inconsistent and scattered catches of albacore which occurred along much of the west coast were related to the failure of albacore forage organisms to concentrate as the result of weak coastal upwelling. Coastal upwelling indices produced at the Center's Pacific Environmental Group in Monterey indicate that upwelling was inconsistent and anomalously low along much of the Pacific coast of the U.S. during much of the albacore fishing season. When coastal upwelling is more pronounced, which is usually the case during the summer months, a relatively strong "ocean front" or gradient between cool, upwelled waters and warmer, non-upwelled water is formed. High biological productivity is associated with the upwelling front and albacore forage organisms are found concentrated there. Research by Dr. Laurs and his associates at the La Jolla Laboratory has shown that albacore remain in the vicinity of upwelling fronts (presumably feeding) while an upwelling front is well-developed, but move away from the area where the front was located when the front breaks down. Examination of albacore catch records also show that fishing success is highest in the vicinity of upwelling fronts.

Virtually nothing is known about why albacore do not "bite." However many albacore fishermen complained during the 1977 fishing season that they sighted schools of albacore at the surface or at depth on sonar, and that simultaneously fishing conditions were good, but that the fish would not bite. This problem was especially prevalent off central and southern California and off northern Baja California. Inclement weather conditions also apparently have markedly affected fishing effort off northern and central California. Fishermen reported that they were able to operate for only a small number of days before having to move to another area or return to port due to high wind and rough seas. This has resulted in a substantial loss of fishing time.

In summary a number of environmental factors combined to affect the albacore fishery in 1977, resulting in one of the poorest fishing seasons in 25 years. While environmental conditions appear to have adversely affected albacore fishing success during 1977, age class structure and other population parameters need to be studied to evaluate the poor fishing success with regard to the status of the stock of the north Pacific albacore resource.

Food Habits of Albacore Caught in Offshore Waters Investigated

Albacore-oceanography cruises were conducted in offshore waters generally between 30° to 40°N, 130° to 140°W during June in the years 1972-1977. To investigate the feeding habits of albacore in the offshore

region, stomachs were collected from a portion of the albacore caught on cruises made on the David Starr Jordan in 1973, 1974, 1976 and 1977 (cruises in 1972 and 1975 were made on Townsend Cromwell and stomachs were not collected because of logistics problems). Examination and analysis of these stomachs was made by Fishery Biologist R. Nishimoto of the La Jolla Laboratory.

Differences are apparent in the amounts of food found in albacore stomachs and in diet when comparing stomach analysis data for the different years from fish caught in the offshore area. A summary prepared by Nishimoto by years of the number of stomachs examined, number and percent of stomachs that were empty, amount of food found in the stomachs, and the predominant food organisms(s) is given in Table 1. The percentage of stomachs that were empty was lower, and the range and average amount of food found in the stomachs were higher during 1973 and 1974 than in 1975 and 1976. Fishes (mostly saury) were the predominant food organism in 1973 and squid were predominant in 1974. In 1976 and 1977, crustaceans (mostly amphipods) and juvenile fishes were the predominant forage organisms.

There is an interesting relationship between the success of fishing in the offshore area during the June and the amount of food found in the stomachs from fish caught there. There was good fishing in the offshore waters by AFRF charter vessels and non-charter vessels during June 1973 and 1974 when the amounts of food found in albacore stomachs were large relative to the amounts found in 1976 and 1977 when fishing in offshore waters was poor.

It is generally believed that tuna are opportunistic carnivores and that they feed on the food organisms most readily available. There is also evidence that the rate of feeding in fishes is directly proportional to the availability of food. Based on analyses of albacore food habits, it appears that variations in the availability of food organisms may play a role in determining fishing success in the offshore area during the time when albacore are presumably migrating through that area to inshore waters. In those years when saury and squids are readily available for albacore to feed on in the offshore area fishing success in that area is high relative to those years when albacore apparently must depend on crustaceans and juvenile fishes as food organisms.

Table 1. Summary by year of the number of albacore stomachs examined, number and percent empty, amount of food found in the stomachs, and predominant food organism(s) found in the stomachs.

Year	Number of stomachs	Number (percent) empty	Amount of food in stomachs (ml)		Predominant food
			Range	Average	
1973	33	0 (0%)	0.2-104	16.3	Fish (saury)
1974	75	9 (12%)	0 -165	13.3	Squid
1976	56	7 (13%)	0 - 48	6.5	Crustaceans (amphipods and Fish (saury & juveniles
1977	47	10 (21%)	0 - 18	2.9	Crustaceans (amphipods) and Fish (juvenile mackerel)

Tagging Study Conducted to Evaluate Assumptions in Methods for Estimating Albacore Growth

As part of the cooperative NMFS-AFRF albacore research activities during 1977 a special tagging study was conducted to evaluate assumptions in methods for estimating albacore growth rate and for study of the migration pattern of albacore off southern California. Estimates of albacore growth rate derived from "daily ring" counts made on otoliths are greater than those derived from tag release-recapture data. The "daily ring" increment method of aging fishes assumes that there is a daily ring deposition on the otolith, and the tag releases-recapture method assumes that the growth rate is unaltered by the presence of the tag or by the stress imposed in its application.

Each of these assumptions required testing for albacore (and most other fishes). Field operations were conducted by NMFS technicians in July-September 1977 aboard a small baitboat chartered by AFRF to evaluate the assumption that there is daily ring deposition. Albacore were tagged and injected with tetracycline, an osteophytic agent which is incorporated into bone and which will fluoresce when bone is viewed under ultra-violet light. The otoliths of the tagged fish are thus "marked" at the time of release. For recaptured fish, information and the assumption of daily ring deposition may then be tested.

Also, the "calibrated" otolith method may then be used for absolute age and growth determination, and possibly to test assumptions of the tag-recapture method of deriving growth rate. A total of 644 albacore was injected with tetracycline, tagged with special tags, and released. An advertising campaign was conducted to alert fishermen of the study and to be watchful for recoveries of the specially tagged fish. A \$50

reward was offered as an incentive for the fishermen to turn in information on tag recoveries and the fish. Nineteen recoveries were made of fish that had been at liberty from 0 to 191 days after injection.

Otoliths from four of these fish were processed and daily ring counts made cooperatively by A. Wild and T. Foreman of IATTC using a microscope equipped with ultra-violet light. The fish were nearly the same fork length, ranging from 720mm-751mm and had been at liberty 10, 33, 70 and 113 days. The time to lay down a ring on the otolith ranged from 1.22 to 2.26 days. It would appear, then, based on these preliminary results from these four fish, that the otoliths daily ring method may not be suitable for aging albacore. Otoliths from the remaining 15 fish will be analyzed in the future.

In addition, a second tetracycline injecting field experiment will be conducted during 1978 as part of a tagging study to further investigate movements of albacore off southern California. It is hoped that the results from these requirements will provide information necessary to evaluate the otolith "daily ring" method for aging albacore.

MULTISPECIES TAXONOMY PROGRAM

Distributional Atlas of Rockfish Larval Nears Completion

Senior Scientist E. Ahlstrom reports that the text portion of the CalCOFI Distributional Atlas of fish larvae in the California Current region: Rockfishes, Sebastes spp., 1950 through 1975 (E. Ahlstrom, G. Moser and E. Sandknop) was completed and submitted to Abe Fleminger, Editor of the CalCOFI Atlas, for review.

This is the sixth CalCOFI Atlas dealing with distribution and relative abundance of fish larvae in the California Current region. CalCOFI Atlas #9 (Kramer and Ahlstrom, 1960) dealt with larvae of northern anchovy, Engraulis mordax; #11 (Ahlstrom 1969) with larvae of jack mackerel, Trachurus symmetricus and Pacific hake, Merluccius productus, #12 (Kramer 1970) with eggs and larvae of the Pacific pilchard, Sardinops carulea; #17 (Ahlstrom, 1972) with six common mesopelagic fishes; and #23 (Ahlstrom and Moser, 1975) with eight kinds of flatfishes. With the appearance of this Atlas, distributional charts will be available for all of the more common kinds of larvae taken in CalCOFI collections. As a group these contribute 90% or more of the fish larvae obtained on CalCOFI cruises. This atlas has the most comprehensive coverage of any, inasmuch as a 26-year period is covered. Charts are included for 177 of the 181 CalCOFI cruises made during these years. Sebastes larvae were taken in 42.1% of all CalCOFI collections made between the shore out to (and including) station 90 during the 26-year period. Larvae decreased

in frequency of occurrence from north to south, 68.8% of collections made off Northern California (station lines 40 thru 57) contained Sebastes larva, 67.5% off central California (lines 60 thru 77), 57.0% off southern California (lines 80-97) 31.6% off northern Baja California (line 100-117) and 20.4% off central Baja California (lines 120-137). Few Sebastes larvae are taken off southern Baja California, rather Sebastes is replaced by other scorpaenid fishes in the genera Scorpaena, Pontinus and Scorpaenodes. Although rockfish larvae are less abundant during warm years, such as 1958 and 1959, on the average they are as abundant now as in any previous year. Sixty-five percent of rockfish larvae were obtained during winter cruises, January-March.

In the larval fish rearing project, headed by Fishery Biologist John Butler, a series of Calico rockfish, Sebastes dalli, was reared to the juvenile stage. Two 60-day old fish measuring 21.5 and 24.3 mm completed the series. These are the first rockfish in the eastern Pacific to be raised from embryos to juveniles.

A series of queenfish, Seriphus politus were raised from eggs to fin formation in 26 days. The larvae grew well on wild plankton after initial feeding on Gymnodinium.

The blue-banded goby, Lythrypnis dalli, did not complete fin formation before all larvae died. A representative sample of the early stages were preserved.

* * * * *

Samples from the last of the CalCOFI cruises for 1975 were identified and are being checked before keypunching.

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On April 9, Dr. G. Moser was promoted to Program Leader of the Multispecies Taxonomy task in the Coastal Fisheries Resources Division. He takes over from Dr. E. H. Ahlstrom who will be devoting virtually all of his time henceforth to his research and the writing (with Moser) of a definitive volume of fish eggs and larvae.

Peer Review Committee Recommends Further
Implementation of Acoustic Resonance
Techniques for Fisheries Assessment

At a meeting at the Southwest Fisheries Center, April 26 and 27, Drs. Van Holliday of Tracor, Inc. and Paul Smith of the Center discussed their work on acoustic resonance frequency techniques before a peer review committee consisting of Dr. Richard Backus, Woods Hole Oceanographic Institute, Professor Stanley Murphy, University of Washington and Professor Victor Anderson of Scripps Institution of Oceanography, all recognized as world experts on this subject. Center Director Barrett

and Dr. Reuben Lasker, Leader of the Coastal Division also attended. A report was written by the peer review committee recommending further implementation of the work.

In their report, the committee wrote, "We conclude that the data collection and analysis methods and the interpretation are technically sound. The observed ability of the acoustic system to discriminate swimbladder sizes is a major advance in bioacoustics that has been promised for 25 years."

Another interesting comment of the committee concerned the long-term value of the system which they viewed as far exceeding the presently demonstrated application to anchovy assessment. They wrote, "The technique will be applicable to other geographical areas and commercially important species. In the future, biologists will learn to correlate the synoptic, multi-dimensional acoustic data-base with the biology in ways that cannot be proscribed."

Oceanic Fisheries Resources Division

TUNA RESOURCES PROGRAM

Recently Completed Analysis Reveals Yield-Per-Recruit Changes Following Atlantic Yellowfin Tuna Minimum Size Regulations

Analysis recently completed for a paper entitled "An analysis of the yellowfin tuna (*Thunnus albacares*) stock status in the eastern Atlantic" by Norman Bartoo and Atilio Coan, has produced estimates of yield-per-recruit for the 1975 fishery and confirms a previous yield-per-recruit study which was used as a basis for the current minimum size regulations for Atlantic yellowfin tuna. The current regulation places a prohibition on the landing of yellowfin tuna weighing less than 3.2 kg, except for a 15% (by numbers) incidental catch of small fish per landing. A 3.2 kg fish is equivalent to a fish of 55 cm fork length.

The results of the analysis indicate that in 1975 the eastern Atlantic yellowfin tuna fishery realized a lower (-6%) yield-per-recruit than it did in the late 1960's. This is apparently caused by continued taking of small fish by baitboats and purse seiners. Individually, the purse seiners, baitboats and longliners recorded changes in yeild-per-recruit of +36%. The expected changes in yield-per-recruit at effort levels was evaluated for the entire fishery assuming a total restriction on landing of yellowfin tuna smaller than 55 cm.

The fishery as a whole could realize a 10% increase in yield-per-recruit if undersized fish are not caught or if captured, returned to the sea alive. If all undersized fish caught are discarded dead a loss of about 3% of the current yield-per-recruit would occur. Longliners

do not currently take fish smaller than 55 cm and thus are not involved in dumping of undersized fish. The longliners, however, should gain about 14% in yield-per-recruit with a total prohibition on landing of < 55 cm yellowfin tuna. Purse seiners would gain about 13% in yield-per-recruit if undersized fish captured are not killed. If the purse seiners dump all undersized fish dead, they would experience about a 2% drop in realized yield-per-recruit compared to their current yields.

A large portion of the baitboat catch is undersized fish; consequently the baitboats will realize a 13-17% drop in yield-per-recruit if no undersized fish are allowed to be landed.

The results from a cohort analysis indicates recruitment to age I (Table 1) has averaged about 21 million individuals per year.

Table 1. Estimated parent stock size and resulting recruitment to age I for eastern Atlantic yellowfin tuna from 1965 to 1972.

<u>Birth year of age I recruits</u>	<u>Estimated numbers of parents (ages 2-7) in millions</u>	<u>Estimated age I recruitment in millions</u>
1965	--	14.4
1966	--	25.5
1967	8.8	17.5
1968	13.9	11.5
1969	11.0	23.9
1970	7.8	24.4
1971	10.3	26.3
1972	11.9	25.6

Tuna Vessel Participation in FAX Advisory Program

During April 1978, 20 tuna vessels contributed synoptic weather and XBT (expendable bathythermograph) data to the SWFC FAX Advisory Program. The following table shows data for the month of April 1975, 1976, 1977 and 1978 that were transmitted to NMFS-licensed radio station WWD by participating vessels.

Year	Vessels with equipment	Vessels with Observations	Weather Observations	XBT Observations	Monthly Total	Year-to-Date Total
1975	76	37	328	81	409	1264
1976	73	36	255	38	293	1078
1977	59	4	15	0	15	470
1978	55	20	131	23	154	868

There are several vessels in port again this month, which accounts for the low number of observations. We anticipate higher reporting rates when these vessels return to sea. During April 1977, many vessels were in port to protest government regulations on the fishing of tuna with porpoise and hence the reporting rates were extremely low.

For the second consecutive month, the tuna seiner Santa Rosa, led all FAX program participants with 18 weather observations and 5 XBT observations. Dr. G. Sakagawa, who directs the La Jolla Laboratory's FAX program, said that on behalf of his staff he extended congratulations to Captain John Gomes and his crew on the Santa Rosa and sincere appreciation to all vessels and crew members contributing to the FAX program. He noted that the purse seiner, Gemini, has resumed participation in the program and said that NMFS looked forward to its continued contributions to the NMFS FAX Advisory program.

Results Available on Pacific Billfish Angler Survey

Since 1969, the National Marine Fisheries Service has conducted, in cooperation with big-game angling clubs throughout the Pacific, an annual catch-effort survey of billfishing. The survey provides a rough measure of fishing success in different sportfishery areas of the Pacific. Marine game fish anglers who fished in the Pacific for billfish were asked to complete a postcard form which requested information on number of angler days engaged in billfishing and billfish catch made in 1976. Fishery Biologist Jim Squire of the La Jolla Laboratory coordinates this program for the Pacific.

In 1975, the billfish angler survey program in the Pacific became an annual cooperative survey with the International Game Fish Association. A major problem in evaluating the impact of fishing, both sport and commercial, on the resources of the various billfish species is a reliable estimate of the total number of fish taken each year by sport anglers in

the Pacific. This basic information is one that should be compiled for the Pacific. The billfish sportfishery in the northeastern Pacific off Mexico and the United States is reported to capture at least 10,000 fish each year; however, no accurate totals for sport-caught billfishes in the eastern Pacific are available. Some approximation of the black marlin catch off Queensland, Australia would indicate totals of 500 or 1,000 fish or more per year are taken. The sport billfish catch in the Hawaiian Islands is reported to total up to 5,000 fish per year. The number of billfishes taken by the sportfishery is a fraction of that landed by the commercial fishery. However, the economic value of the sportfishery resulting from the expenditure for goods and services by the thousands of billfish anglers in the pursuit of the sport is probably substantial.

Analysis of 1976 billfish angler survey catch and effort data reported to the SWFC shows an increased total effort of 8,532 angler days catching 3.119 billfish. This is an overall catch rate of 0.36 fish per day or 2.7 days fishing per fish. The 1976 data are comparable to those observed in 1975 when the catch rate was 0.38 fish per day or 2.6 days fishing per fish. However, this rate continues to be well below the 1969-1972 average of 0.55 fish per day, or 1.80 days per billfish.

Following are survey results received in 1976 for the major fishing locations which reported catching striped marlin in the northeastern Pacific and black marlin in the southwestern Pacific. A graphic presentation of the catch-per-angler day data for the major billfishing areas, 1969 through 1976, is given for striped marlin, Tetrapturus audax in Figure 1; and for black marlin, Makaira indica in Figure 2. The number of angler days represented in the points are given on the graphs.

Striped Marlin: Catch and effort results for striped marlin fishing off southern California has remained relatively constant throughout the survey years. The rate appears to vary about the 0.1 fish-per-day level, or about 10 angler days of fishing per fish.

Angler catch rates at Mazatlan have shown a consistent decline since 1969, from a high level of about 0.64 fish per angler day in 1969 to about 0.14 in 1976, a lower level than was observed in 1973, a "poor year" of fishing for all striped marlin fishing areas in the northeast Pacific.

Fishing about the southern tip of Baja California, Mexico, a fishing location nearer the center of distribution of striped marlin in the northeastern Pacific than any other popular fishing area, showed an increase in catch rate 1969 through 1971. After 1971, a sharp decline in catch per angler day is evident through 1973--declining from a high of over 0.80 fish per angler day in 1971 to a low of 0.35 in 1973. Since 1973, the catch rate has recovered slightly from the 0.35 level to the 0.5 fish per angler day level observed in 1976. The catch curves for striped marlin appear to have a general uniformity of trend, downward from 1969 to 1973, with some recovery since 1974, with the exception of the port of Mazatlan.

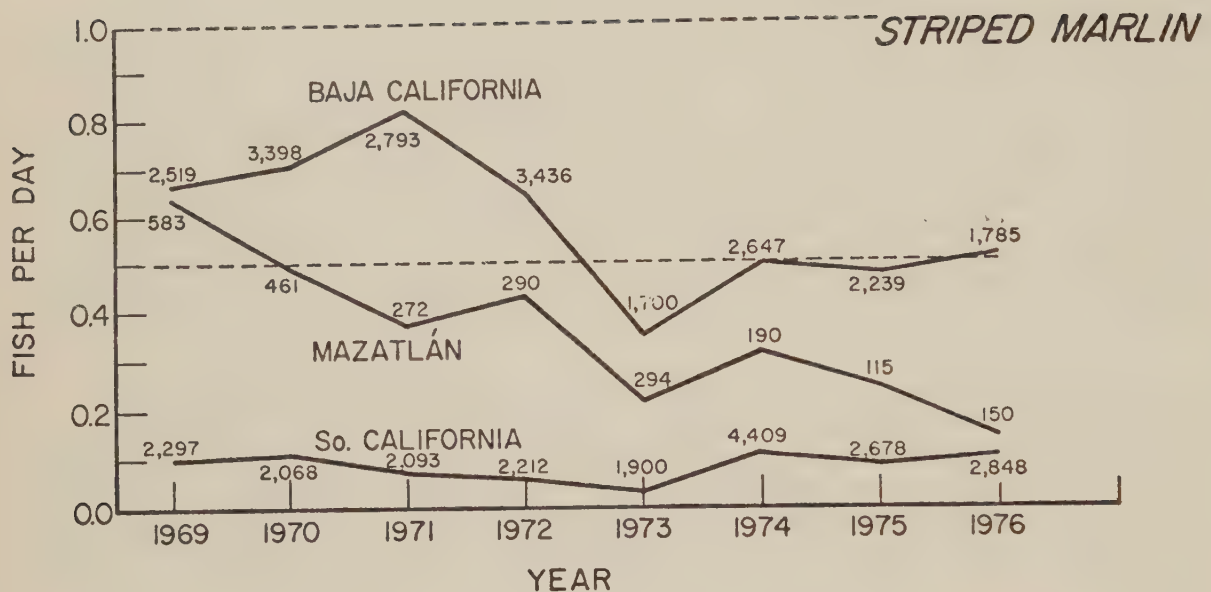


Figure 1. Sportfishing catch per day for striped marlin in the eastern Pacific. Numbers on graph represent angler days.

Black Marlin: A substantial increase in the catch per angler day was recorded off Cairns, Australia in 1971 over that observed in 1969 and 1970. Increased efficiency of the sport fleet may be a factor since the fishery for black marlin is one of recent popularity. However, for such a substantial increase, an increase in availability or stock size would be suspected. An average of about 1.2 fish per angler day was recorded for the period 1971 through 1974. Since that time the catch rate has declined to about 0.60 level in 1975 and 1976, representing about a 50% reduction in catch rate from the 1971-1974 level.

The black marlin resources in the southwestern Pacific are the subjects of a commercial longline fishery in the same general area as the sportfishery on this species. High concentrations of black marlin are present near the Barrier Reef areas in the Coral Sea which is reported to be a spawning area; excellent catches of large fish are made by the sportfishery here:

Angler catch rates have declined in recent years and it is possible both commercial and sportfisheries are affecting the stock of black marlin, which is not large, in comparison to the biomass of other billfish species in the Pacific such as the striped marlin, blue marlin, sailfish and swordfish.

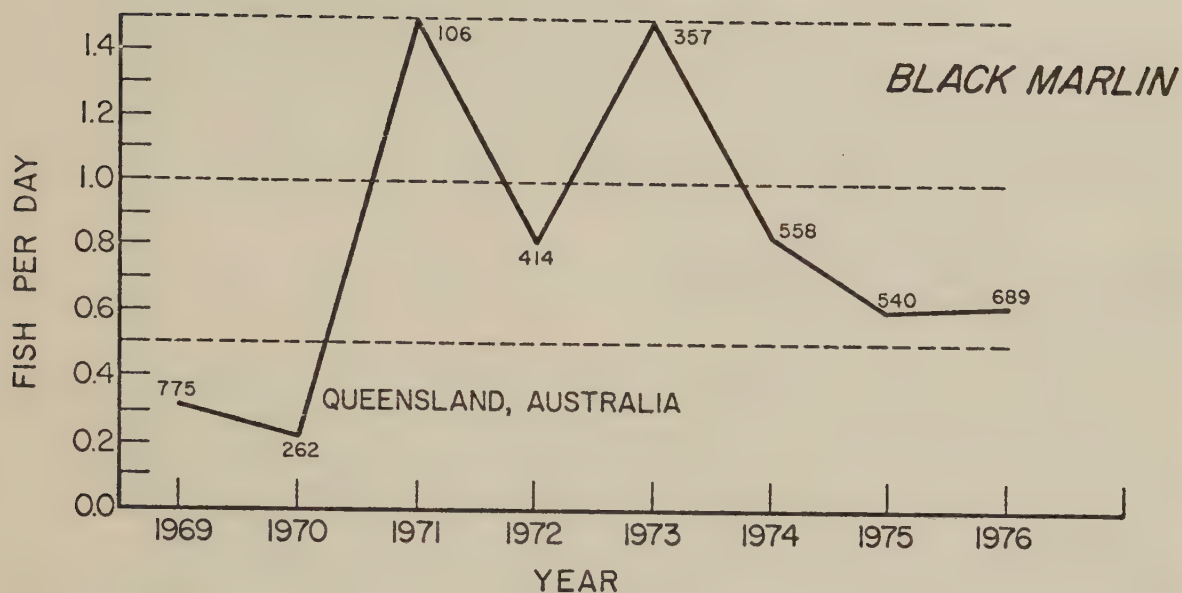


Figure 2. Sportfishing catch per day for black marlin off Queensland, Australia. Numbers on graph represent angler days

MARINE MAMMAL BIOLOGY AND TECHNOLOGY PROGRAM

Second Research Cruise of Dedicated Vessel in Progress

Jackie Jennings, Jim Coe, Warren Stuntz and their support crew presently are in the eastern tropical Pacific on the second cruise of the dedicated vessel, Queen Mary, out of San Diego carrying out experiments with whole schools of wild dolphins with the newly-developed porpoise impoundment gear system. Scheduled activities include tagging, release, dolphin cohesion studies, the collecting of blood samples and other biological data from live-captured animals and necropsies of animals incidentally killed. Meanwhile, Coe and others are scrutinizing performance of the mortality reduction and porpoise impoundment gear in anticipation of further improvement modifications. Cruise two is expected to be completed on May 17.

Cruise Three and Four of Dedicated Vessel Planned

Cruise plans for trips three and four of the dedicated vessel are in preparation. Cruise Three (June 3-July 28) will be concerned mainly with the examination of alternative fishing methods and will include projects testing acoustic and olfactory lures, dolphin and tuna behavior, and modifications to fishing-gear systems. Cruise Four (August 17-October 5) will involve whole-school tagging, tetracycline marking and studies of comparative behavior of dolphins.

Japanese/U.S. Research Program Being Established to Study Dall Porpoise in North Pacific Salmon Gill Net Fishery

Dr. William F. Perrin, Leader, Marine Mammal Biology and Technology Program at La Jolla, flew to Tokyo in late April as a U.S. representative to participate in meetings to plan research on Dall porpoise populations impacted by the North Pacific Salmon gill net fishery. Agreements reached between Japanese and U.S. delegates as a result of the sessions are that the Japanese will: 1) collect and report to U.S. the data associated with incidental take of porpoise and catch of salmon, 2) provide to U.S. summaries of all past data, and 3) collect and forward to U.S., sighting and sighting effort data. The U.S. has agreed to provide equipment, supplies and training for sampling and data collecting by Japanese crews. The U.S. will analyze life history data and develop gear for porpoise mortality reduction. Representatives of Japan and the U.S. plan to meet again next year in Tokyo to review progress of the program and to plan specific research.

Interest High in Conferences on Age Determination of Odontocete Cetaceans

Wildlife Biologist A. Myrick at the La Jolla Laboratory who is serving as the chairperson of the Conference Coordinating Committee, reports that he is receiving strong and favorable response to the announcements of the conference on age determination and workshop which is scheduled to be held in La Jolla beginning September 5. As of this writing more than 70 respondents plan to attend and 26 have indicated their wish to present papers. Any inquiries concerning this conference should be directed to A. Myrick or to the convenor, Dr. William Perrin, at the Southwest Fisheries Center, La Jolla, California 92038.

* * * * *

Fishery Biologist M. Kimura at La Jolla is preparing an annotated bibliography of papers on age determination of marine mammals. The finished manuscript is to be published in concert with the symposium papers that are to be presented at the International Conference on Age Determination of Odontocete Cetaceans. In addition to the National Marine Fisheries Service, the conference is sponsored by the U.S. Marine Mammal Commission, International Whaling Commission, and the International Union for the Conservation of Nature.

* * * * *

Other developments in the Marine Mammal Biology and Technology program during the past month include the following:

Dr. Perrin reports that the staff is current on the processing of biological observer data for the 1978 tuna fishing cruises.

Fishery Methods and Equipment Specialist, D. Holts, is nearing completion of the cruise gear report detailing studies undertaken on the first cruise of the dedicated tuna vessel, Queen Mary.

Work also continues on the preparation of thin sections of teeth and bone for microscopic studies of hard tissue layering in dolphins.

MARINE MAMMAL ASSESSMENT AND MONITORING PROGRAM

Dr. Powers Participant in Planning Workshop on Aerial Surveys of Bowhead Whales

Dr. Joseph E. Powers, Leader of the Marine Mammal Assessment and Monitoring Program at La Jolla, traveled to the Northwest Fisheries Center in Seattle on April 5 to participate in a planning workshop on aerial surveys of bowhead whale populations in Alaska. The aerial surveys coupled with shore-based ice stations will be used to assess the status of the bowhead whale stock and subsequently to establish allowable levels of take by Eskimos. The workshop was also attended by representatives of the Northwest and Alaska Fisheries Center (who is sponsoring the research), the Marine Mammal Commission, University of Washington, and the Naval Ocean Systems Center. Discussions focused on the scope of the surveys, types of transects to be flown, and the analytical procedures which will be required.

Procedures Established for Estimating and Monitoring Porpoise Mortality During 1978

Dr. Nancy Lo and Bruce Wahlen at the La Jolla Laboratory have established the procedures for estimating and monitoring porpoise mortality by the U.S. yellowfin tuna purse seine fleet during 1978. The procedure is done on a weekly basis and involves radio-reporting from NMFS observers aboard tuna vessels, reports of fleet departures and arrivals by the SWR, and a computerized statistical estimation (algorithm). Lo and Wahlen are also using the accumulated data on statistical distributions of trip times and kill rates to develop a Monte Carlo simulation model of the sampling-estimation method. The model will be used to design optimal and efficient sampling plans, such that variation in the estimates are reduced as much as is feasible.

* * * * *

Data received from NMFS observers aboard U.S. tuna vessels during 1977 have gone through initial processing by the Data Management sub-task, headed by Charles Oliver, Computer Specialist at La Jolla. The records of each set made by observed vessels have been manually and computer edited and placed on the computer data bases.

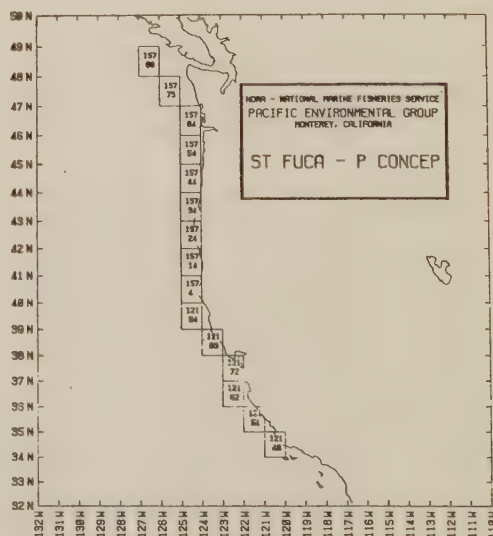
Other 1977 records (primarily marine mammal sighting logs) are being processed through the system. A more efficient method of species coding of sightings, laid out by Steve Leatherwood under a NOSC contract, has reduced the lag time for processing sighting logs. The method involves specified criteria for coding which is performed by the Data Editing Group, headed by Frank Ralston. This has allowed the data editing phase to approach the completion of 1977 much more quickly. Thus, the 1978 data can be processed as they are generated.

PACIFIC ENVIRONMENTAL GROUP

OCEAN CLIMATOLOGY AND MONITORING

Dr. Douglas McLain of the Pacific Environmental Group (PEG) at Monterey has recently prepared summary plots of variations of sea surface temperature along the U.S. east and west coasts. These plots are used for monitoring ocean fluctuations in coastal areas and will be used in annual NMFS oceanographic summaries of U.S. coastal waters. The plots are based on means by 1 degree squares of sea surface temperature observations received in real-time by Fleet Numerical Weather Central.

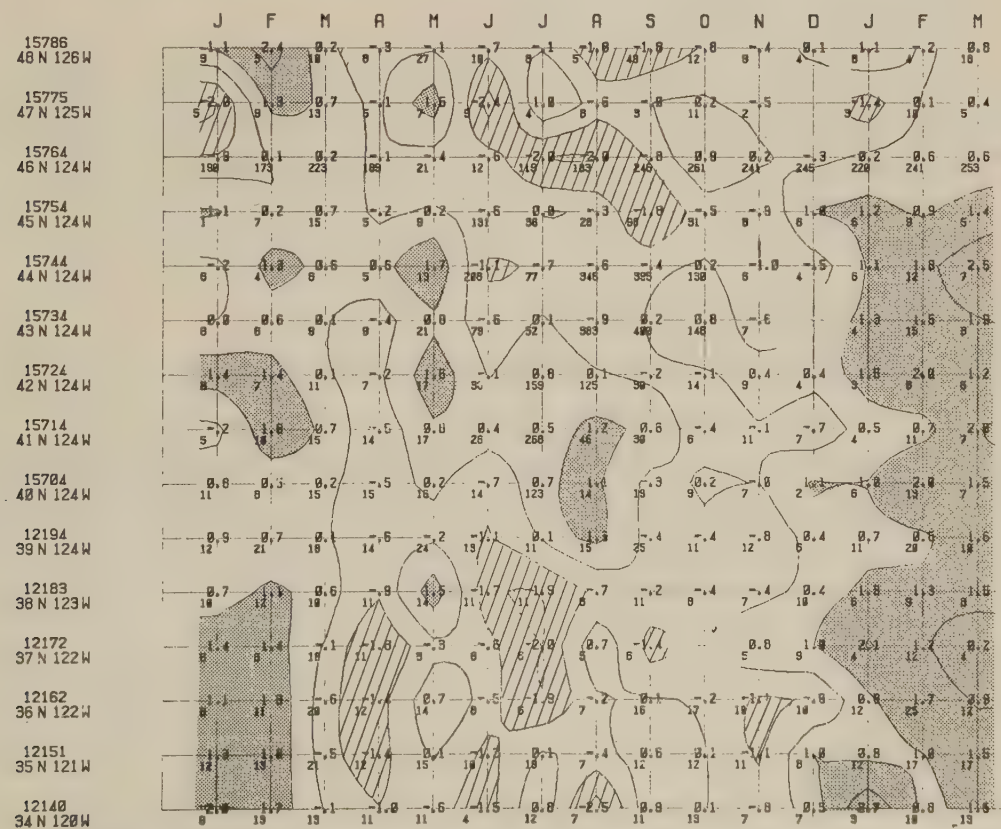
The following figure is such a plot for the coast between the Strait of Juan de Fuca and Point Conception. The vertical axis is distance along the coast (see location map) and the horizontal axis is time for the period January 1977 to March 1978. Plotted on the figure are anomalies of sea surface temperature from a long term mean (1948-67) and the number of observations. The figure shows that the coastal waters were generally warmer than normal during January to March 1977. During April to November the temperature anomalies were more variable but were generally cooler than normal except for a warm region during July and August at 39 to 42°N and smaller warm regions in other area. During December to March 1978, temperatures were generally above normal, particularly in February and March.



Location Map

The variations of sea surface temperature along the coast are fairly well correlated with variations of the upwelling index, presented by Bakun in the SWFC monthly report for October 1977 for the first nine months of 1977. For example, the upwelling index was much higher than normal along this section of coast in March 1977 and anomalies of sea surface temperature decreased from often greater than $+1.0^{\circ}\text{C}$ in February to less than $+1.0^{\circ}\text{C}$ in March and became generally negative by April. Lower than normal upwelling occurred in May and sea temperatures anomalies again became generally positive in May. Upwelling was strong again in June and July, particularly at 39 to 24°N . The anomaly of sea surface temperature decreased to generally negative values in June but became positive in July, perhaps in response to some other process such as heat exchange or horizontal advection.

Upwelling in October and November has been above normal from 39°N southward and generally negative anomalies were observed. Since December upwelling has been extremely weak along the coast, particularly from 45°N southward and strong positive temperature anomalies are observed. Correlation of upwelling and sea surface temperature anomalies is not unexpected but it is gratifying to find agreement between dissimilar data sets, particularly from such scattered observations as ship of opportunity weather observations.



Anomaly of sea surface temperature in $^{\circ}\text{C}$ from long term (1948-67) mean and number of observations in 1 degree squares along west coast from Strait of Juan de Fuca at top of figure to Point Conception at the bottom. One degree squares are labeled by Marsden square and subsquare. Contour interval is 1.0°C . Anomalies below -1.0°C are diagonally hatched and anomalies above $+1.0^{\circ}\text{C}$ are shaded.

TIBURON LABORATORY

FISH COMMUNITIES INVESTIGATION

Upwelling on Mendocino Coast Late this Year

Biological data indicate coastal upwelling, usually in force along the Mendocino coast by mid-March, had not developed by mid-April this year. The seasonal occurrence of this phenomenon has been shown to drive certain cyclic behavior patterns in members of the fish communities being studied by Fishery Biologists Dr. Edmund Hobson and Tony Chess of the Tiburon Laboratory. Working at their Albion study site Hobson and Chess found oceanic plankters and relatively warm (12° C) water close inshore. The oceanic plankters were the major foods of the adult blue rockfish that were sampled at this time. The observed absence of upwelling at this late date is consistent with upwelling indices generated by the Southwest Fisheries Center's Pacific Environmental Group at Monterey.

Feeding by Brown Rockfish Appears Limited During Winter

The brown rockfish, Sebastes auriculatus, was found to have a much reduced fat content from January to March, compared to October to December, based on studies by Fishery Biologist Peter Adams at Tiburon. A similar sharp reduction in fat content was noted during the same period last year, suggesting that feeding is limited at this time of the year.

Study Shows Dover Sole Fishery in Oregon can be Expanded but Fisheries for Two Other Soles Near Limits

In Oregon, the fishery for the Dover sole, Microstomus pacificus, can be expanded, but those for the English sole, Parophrys vetulus, and petrale sole, Eopsetta jordani, appear close to their maximum sustained yields. This is the conclusion of Fishery Biologist Dr. William Lenarz, based on data presented in a manuscript he revised this month. His analysis of yield per recruit indicates that management should consider a larger mesh size in the nets used to take these species. This paper will be discussed by the Groundfish Management Plan Development Team in June.

Workshop in Methods to Age Groundfish Held at Nanaimo

A Groundfish Age Determination Workshop was held at the Pacific Biological Station in Nanaimo, B.C., Canada and participating was

Fishery Biologist Tina Echeverria of the Tiburon Staff. Current methods in aging Pacific cod, lingcod, rockfish, sablefish, and Dover sole were discussed and examined. A variety of structures used in aging such as the scale, otolith, and fin rays were processed in a variety of ways to determine the best method and structure for a particular species. The workshop served as a good review of the nature of the art of aging and for an exchange of problems and criteria used by biologists working with the same or related species.

FISHERIES DEVELOPMENT INVESTIGATION

Laboratory Continues Fisheries Development Investigation

Tom Barnes, Biological Technician at Tiburon, went on a trip aboard fishing vessel Cape Windy to test the laboratory's Furuno Net Monitor. An electronics technician from the vending firm also went along to try to determine the cause of the gear's failure to operate properly. Nothing definite was learned but one possible problem was uncovered: the vessel's electrical output measured only 75 volts rather than 110 volts. Further trials will be made aboard the vessel after the unit is tested in the electronics lab.

A San Pedro fisherman made two trips to Catalina Island to catch spot prawn, (Pandalus platyceros) with traps loaned to him by members of the Fisheries Development group. The catch rate was disappointing, but it was discovered that the prawns are in much deeper water than hitherto suspected. Catches were frequently made in depths of 150-180 fathoms, and some set at 250 fathoms also caught spot prawn. The fisherman is anxious to continue experimental fishing, but lack of income may force him to abandon this.

100,000 King Salmon Young Delivered to Tiburon Laboratory

Fishery Biologist Roger Green at the Tiburon Laboratory reported that 100,000 king salmon, 38,000 of them nose-tagged, were delivered to Tiburon this month by California Department of Fish and Game and transferred to the salt-water rearing pens. Average size of these fish was 3.5 grams. The fish appear to be doing well and are taking dry pellet rations readily.

Dan Ralph, Fishery Biologist, established controlled flow rates with the morphalene-releasing drip apparatus for imprinting salmon and set up a drip system over one pen of kings.

Five king salmon tags and two coho salmon tags were returned by anglers this month.

PHYSIOLOGY INVESTIGATION

Striped Bass Task

The first successful spawn of the 1978 striped bass season took place April 19 and with it a series of experiments began on the factors affecting mortality in the egg and larval life stages. California Department of Fish and Game field studies and hatchery experience have shown spawning success varies with water types. Dr. J. Whipple and her staff are studying the effects of different waters from the natural spawning areas, hatchery wells and Tiburon Laboratory on fertilization and development through hatching. With cooperation of the U.S. Bureau on Reclamation Analytical Laboratory, they are chemically analyzing the different waters with emphasis on important physiological ions. Iron, and iron with chelators, in particular, are being emphasized based on preliminary experiments and literature.

Survival and development of striped bass larvae fed food rations approximating natural field conditions is being monitored. Related to this is the determination of the point-of-no-return. Results from previous experiments showed larvae to be very resilient and able to withstand starvation for periods in excess of three weeks. Larvae are currently being tested at different starvation intervals up to 26 days after fertilization. To complete the understanding of the energy requirements for growth and survival, fishery biologists are determining feeding and digestion rates under different food concentrations at progressive stages of development. These intensive studies will continue through several spawnings expected to last until late July.

Whipple and Brian Jarvis, Biological Technician, are taking weekly field samples of adult striped bass during their spawning migration. Samples are being taken by gill net from the Tiburon dock to capture prespawning and postspawning stripers, and spawning stripers are being sampled with the cooperation of the CDF&G tagging program in the Delta. Fish are being completely autopsied and subsampled to determine the range of genotypic and/or congenital variability in adults and their gametes during the spawning migration. The significance of genotypic and congenital variables in affecting subsequent gamete, egg and larval mortality will be assessed in connection with supplementary lab experiments. The variability in a number of parameters is being assessed, including: green pigments, dimensions, energy content, lipids, carbohydrates, proteins, isoenzymes, cytoplasmic maturation and pollutants in the ovarian eggs; and meristics, condition factors, serum proteins, diseases and parasites, and pollutants of the parental adults.

OCSEAP Petroleum Task

Dr. Whipple is preparing a paper for presentation in Keystone, Colorado for the AIBS Conference on Assessment of Ecological Impacts of Oil Spills, June 14-17. The title of the paper is "Effect of chronic concentrations

of petroleum hydrocarbons on spawning stages of adult starry flounder (Platichthys stellatus), by Jeannette A. Whipple, Thomas G. Yocom, David R. Smart and Meryl Cohen.

The chemical analyses of OCSEAP samples generated by experiments exposing starry flounder to the water-soluble fraction of Cook Inlet crude oil through the water column and through food (littleneck clams) are near completion. Data analysis is underway.

PUBLIC AFFAIRS

- April 12 - Dr. Eric Barham discussed the porpoise research program and showed the American Tunaboat Association film on the Elizabeth C. J. charter to Dr. Richard Phillip's class in "Ecological Problems" at San Diego University.
- 13 - Ulf Casten Carlberg, Marketing Assistant and 10 Trade Commissioners, of the Swedish Trade Mission to the U.S., visited the Center. L. Vlymen was their lecturer and tour host.
- 14 - Dr. Clyde Dorman and geology class from San Diego State University. L. Vlymen discussed on-going fisheries research at the Center's laboratories and later guided the visitors on a tour through the Center.
- 20 - Every year since 1964, the Center has been host to participants in the Greater San Diego Science Fair. This year, Dr. G. Moser, Leader of the Multispecies Taxonomy program, prevented a lecture to the group and later led them on a tour of the Center's facilities. Approximately 25 Science Fair participants and their advisors visited the Center. Also, as he has for many years past, Director Barrett was a judge in the biology division of the Science Fair.
- 21 - To stimulate interest and understanding of various heritages, NOAA has designated specific Awareness Weeks during the year as part of the overall EEO program. To mark their participation in Native American Awareness Week, Administrative Assistant, A. Coit, arranged for a panel discussion at La Jolla on Indian Affairs; this was accompanied by a film, "The Longest Walk." Shown in the accompanying photograph are the panelists who participated, all from the San Diego Indian Center. Left to right are: Roy Lattin, Shoshone, Vice Chairman of the Pala Reservation; Rosalind Hussong, Chickasaw,

Director, Educational Talent Search; Elizabeth Windsong, Shoshone, San Diego Indian Center; and Dr. Christine Murphy, Psychologist and Coordinator, Educational Talent Search.



- April 21 - Dr. Edmund Hobson and Roger Green of the Tiburon Laboratory gave talks to fishery biology students at the College of Marin. Hobson spoke on California fish communities and Green discussed pen-rearing of salmon.
- 24 - Fishery Biologist Ron Rinaldo of the La Jolla Laboratory spoke to two classes at Ericson Elementary School in San Diego who are currently studying sea life and the oceans for a science unit, on the subject, "Working as a marine biologist."
- 25 - Dr. Paul Smith presented a seminar to the staff of the Southern California Coastal Water Research Project in El Segundo, California on, "Aging of fish by underwater acoustics," as part of the regular seminar series given by SCCWRP.
- 26 - Dr. Eric Barham traveled to Mission Viejo, California to participate in Career Day at Saddleback College.

RECENT ADDITIONS TO SWFC STAFF

John Carr Selected as Deputy Director,
Southwest Fisheries Center

On April 10, John Carr arrived in La Jolla to take up his duties as Deputy Director of the Southwest Fisheries Center. Carr's most recent

position was as the Great Lakes Liaison Officer for NMFS in Ann Arbor, Michigan where he worked with the commercial fishing industry of the Great Lakes, providing solutions to problems through the mechanism of NMFS facilities, Sea Grant institutions, fishery management agencies of the eight Great Lakes states, and other federal agencies.

Carr was born in 1929 in Johnson City, Tennessee. He returned to college after three years in the Air Force, graduating with honors from Michigan State University. In 1960, he accepted a position with the then Bureau of Commercial Fisheries in Ann Arbor, Michigan as a fishery biologist assisting in an investigation on the cold water fish stocks of Lake Michigan. Subsequently, he was promoted to progressively more responsible positions with the BCF in Ann Arbor, becoming over the years an expert on the limnology of the Great Lakes.

He has participated in numerous conferences, workshops and committees dealing with such matters as water quality standards and pesticide monitoring. In 1973, he was a member of a 6-man official U.S. delegation to the Soviet Union to discuss the prevention of pollution of lakes and estuaries. Carr is a member of the American Fisheries Society, American Institute of Fishery Research Biologists, and American Society of Limnology and Oceanography.



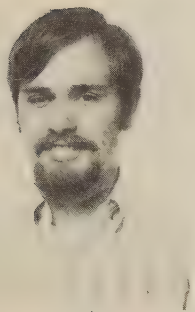
John Carr
Deputy Director, SWFC

Carr is married to the former Claire Elliott, and has four grown children, three girls and a boy.



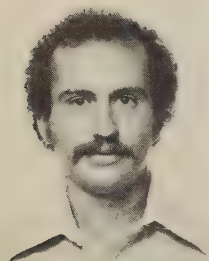
BONNIE G. NEECE - EOD: 12-8-77

Clerk-Stenographer - ADP Operations



DAVID C. McCONAGHY - EOD: 12/23/77

LTJG, NOAA Corps - Albacore Fisheries Program,
Coastal Fisheries Resources Division



MARK F. SULLIVAN - EOD: 7/25/77

LTJG, NOAA Corps - Albacore Fisheries Program,
Coastal Fisheries Resources Division



RENNIE S. HOLT - EOD: 3/12/78

Operations Research Analyst - Stock Assessment Section, Marine Mammal Assessment and Monitoring Program, Oceanic Fisheries Resources Division

TRAINING

Honolulu Laboratory

- April 17-18 - Mrs. Hazel Nishimura, Librarian, attended a DIALOG system seminar conducted by the Lockheed Information systems held at the Hawaiian Telephone Company.
- 18 - Mr. Victor Honda attended a Time Sharing Option class at the University of Hawaii Computing Center.

La Jolla Laboratory

- April 3-7 - Program Planning Officer David Mackett, SWFC, at the University of California, Los Angeles to attend course on "Technical Presentation and Proposal Design and Control."
- 23-26 - A. Myrick, Wildlife Biologist and R. Miller, Biological Technician, La Jolla Laboratory, traveled to Los Angeles to attend the Civil Service Commission course, "Introduction to Supervision."

HONORS AND AWARDS

Honolulu Laboratory

Dr. Andrew E. Dizon, Fishery Biologist, in the Federal Manager of the Year category, and Dr. Roy Mendelssohn, in the Federal Employee of the Year category, were announced as the Honolulu Laboratory's nominees for the annual Hawaii Federal Day Happening to select Hawaii's outstanding Federal employees.

Ms. Marian Yong has been selected to appear in the 1977-78 edition of "Personalities of the West and Midwest" in recognition of past achievement and outstanding service to community and state.

SEMINARS

Honolulu Laboratory

- April 12 - Ms. Marian Yong spoke on "BMDP--Biomedical Computer Programs, P-Series" at the University of Hawaii Computing Center's INTERFACE, a series of seminars covering many different computer topics.

La Jolla Laboratory

- April 4 - Dr. Jan E. Beyer, Institute of Mathematical Statistics and Operations Research, The Technical University of Denmark; "Modelling natural mortality of larval fishes with emphasis on experimental studies."
- 18 - Dr. Katherine A. Green, Contractor for Marine Mammal Commission, El Paso, Texas; "Role of mammals in California current system--beginning of an ecosystem model."
- 19 - Dr. Taivo Laevastu, Northwest and Alaska Fisheries Center, Resource Ecology and Fisheries Management

Division; "Deterministic simulation of marine ecosystems for fisheries." Dr. Laevasta remained for further consultation with members of the Coastal Fisheries Resources members.

Tiburon Laboratory

April 21 - Dr. Tyson R. Roberts of California Academy of Sciences gave a talk on "The Fishes of the Fly River, New Guinea."

VISITORS

Honolulu Laboratory

- April 5 - Messrs. Jack Harman, Ralph Patterson and Mark Rice, SEACO Pan Pacific, a local marine industrial firm, made a 2-hour presentation on their "swath fishing vessel" to Messrs. Shomura, Otsu and Donald Aasted. Slides of their vessel were shown in the seminar room.
- 7 - Dr. Jean Cramer visited Mr. Shomura and Dr. Dizon to discuss the burnt tuna project.
- Dr. Gerald G. Marten, an applicant for a Honolulu Laboratory Fishery Biologist position, met with Mr. Shomura and Dr. Wetherall.
- 25 - Dr. John Bardach, Resource Systems Institute (RSI), East-West Center, escorted Dr. Chent-Kuei Tient, Professor and Vice-Director, Institute of Oceanology, and Dr. Jui-Nyu Liu, Department of Invertebrate Zoology, both at the Academia Sinica, People's Republic of China, on a visit to the Honolulu Laboratory's Kewalo Research Facility. Also accompanying the group were: Dr. Y. H. Yang, RSI, and Mr. J. Hanson, an East-West Center Grantee.
- 27 - Mr. Otsu met with Mr. Robert V. Miller of the Division of Marine Mammals and Endangered Species, NMFS, Washington, who had just returned from meetings in Tokyo.

La Jolla Laboratory

April 4-6 - Dr. Geoffrey Laurence, Narrangsett Marine Laboratory, at the Center with Dr. Jan Beyer.

- 10 - Dr. Bernard Manowitz, ERDA, Brookhaven, New York.

- April 14 - Andrew J. Kemmerer, NMFS Fisheries Engineering Laboratory, Bay St. Louis, Mississippi.
- 18 - Dr. Katherine Green, Contractor for the Marine Mammal Commission, El Paso, Texas.
- 19 - Dr. Taivo Laevastu, Northwest and Atlantic Fisheries Center, Seattle, Washington.
- 20 - Henry Shek, NOAA, Pacific Marine Center, Seattle; Ron Newsom, Captain, NOAA, Rockville, Maryland; Dick Ottone, NOAA, Rockville, Maryland; John Lund, NOAA, Pacific Marine Center, Seattle; A. Isaacson, M. Rosenblatt and Son, Inc., Marine Architects, to discuss Jordan refurbishment.
- 24 - Dr. Howard Feder, University of Alaska, Fairbanks here to discuss joint Bering Sea proposal with Dr. Lasker.
- Dr. Jack Conway and his assistant Baley Sillick, Naval Photographic Center, Washington, D.C. who are developing a script for a film on the wise use of the sea.
- 25 - Richard H. Backus, Woods Hole Oceanographic Institution, Woods Hole, Massachusetts.

Pacific Environmental Group

- April 18 - Mr. Bayley Silleck - Craven Films, New York, New York.
- Mr. Jack Conway - Naval Photographic Center, Washington, D.C.
- 25 - Cdr. Dick DeRyche, NOAA/NWS, Washington, D.C.
- Mr. Sig Larsen, NMC/NWS, Camp Springs, Maryland.
- 27 - Dr. Gary Sharp, IATTC, La Jolla, California.

Tiburón Laboratory

- April 6 - Wes Silverthorne, NMFS, Terminal Island, California.
- 10 - Stan Rice, NMFS, Auke Bay, Alaska.
- Sachiko Otsuka, Otsuka Co., Tokyo, Japan and Tacoma, Washington.
- 12 - Robert A. Baker, Cockeysville, Maryland.
- 18 - Richard Takahashi, University of California, Berkeley, California.

- April 18 - Jack L. Boyd, Battelle Northwest, Richland, Washington.
- LaVerne Jenkins, Battelle Northwest, Richland, Washington.
- 21 - Margaret Bradbury, San Francisco State University, San Francisco, California.
- 27 - John Olmsted, Los Altos, California.
- 28 - R. Chris Fee, NASO, Terminal Island.
- John F. Carr, SWFC, La Jolla, California.
- Izadore Barrett, SWFC, La Jolla, California.

MEETINGS AND TRAVEL

Honolulu Laboratory

- March 28 -
- April 7 - Dr. M. Laurs in Providence, Rhode Island to attend a Workshop on Climate and Fisheries and thence to Washington, D.C. to attend a special meeting to review fishery-related proposals for SEASAT funding.
- April 3 - Director Shomura returned to the Honolulu Laboratory after attending the IPFC meetings in Manila and the United States-Republic of China Economic Council meeting in Taipei. Shomura was on travel status from February 26 to March 31. Tamio Otsu was Acting Laboratory Director during his absence.
- 3-5 - Director Norman Abramson of the Tiburon Laboratory traveled to Atlanta, Georgia to attend a meeting of the Source Evaluation Board for Marine Recreational Statistics Survey Contract.
- Ed Ueber, Tiburon Laboratory, to Portland, Oregon for a meeting of the Dungeness Crab Management Development Team.
- 3-6 - Tina Echeverria, Tiburon Laboratory, traveled to Nanaimo, B.C. to participate in a Groundfish Age Determination Workshop at the Pacific Biological Station at Nanaimo.
- 4 - Dr. William Fox, La Jolla Laboratory, traveled to Washington, D.C. to participate in an International Commission for the Conservation of Atlantic Tunas Advisory Committee meeting.
- 4-5 - Dr. J. Powers, Chief of the Marine Mammal Assessment and Monitoring program, in Seattle, Washington to help plan the bowhead whale population assessment aerial survey. The project is slated to begin later this year off the northern coast of Alaska.

- April 9-14 - Fishery Biologist A. Alvarino traveled to Ensenada, Baja California, Mexico to attend the VI National Congress of Oceanography.
- 10-12 - SWFC Director I. Barrett, Chairman, presided at the 7th Meeting of the Scientific and Statistical Committee of the Western Pacific Regional Fisheries Management Council (April 10-11) at the Honolulu Laboratory conference room. Shomura, Deputy Chairman of the SSC, also attended the meeting.
- 12 - Program Planning Officer David Mackett attended the 40th Annual Meeting of Pacific Fishery Biologists at Clear Lake, California where he participated in a panel on resource management under the Fishery Conservation and Management Act of 1976--the 200-mile limit. Mackett spoke on the subject of information needs for fisheries management under the FCMA.
- 12-14 - Attendees from Tiburon at the Pacific Fishery Biologists meeting at Clear Lake were: Norman Abramson, Mickey Eldridge, Sus Kato, Dan Ralph Roger Green, Pete Benville, and Ross Smart. Attending from PEG was Paul Sund.
- Ed Ueber, Tiburon Laboratory traveled to Portland for a meeting of the Groundfish Team/Advisory Panel.
- 12-15 - Dr. R. Lasker, La Jolla Laboratory, in Tallahassee, Florida to attend a conference on ecological processes in coastal and marine systems. Lasker presented a paper on, "Hypothesis on the relation between weather, mean circulation, and fish recruitment."
- 14 - Dr. Bill Lenarz, Tiburon Laboratory, to Portland for the meeting of the Groundfish Team/Advisory Panel.
- 16-21 - Mackett traveled to Woods Hole, Massachusetts, Beaufort, North Carolina and Miami, Florida to investigate NMFS and state fishery statistics systems, attend a Northeast Fisheries Center program review and confer with members of the National Data Management Committee.
- 17-21 - Mr. Dave Husby, PEG, traveled to Miami Beach, Florida to attend the Spring AGU meeting.
- F. Kellenberger, Data Systems Manager, SWFC, traveled to Woods Hole, Massachusetts and to San Francisco to attend the National Data Management Committee Meeting and to attend the Federal ADP Council meeting.

- April 18 - Shomura departed Honolulu for Suva, Fiji, to accompany U.S. State Department officials in discussions with islands government officials regarding the proposed creation of the South Pacific Fisheries Agency. Other meeting sites are Honiara and Papua New Guinea, Australia, New Zealand, and Western Samoa. Mr. Otsu will serve as Acting Laboratory Director during Mr. Shomura's absence.
- April 20 - Araha Vala, Fishery Administrative Trainee, returned to Papua New Guinea after an intensive administrative training session in Hawaii.
- Dr. Lenarz and Tina Echeverria of the Tiburon Laboratory to California Department of Fish and Game at Menlo Park to discuss the rockfish sampling annual report and age determinations.
- Acting Laboratory Director Otsu, Honolulu Laboratory, participated in a meeting with Mr. Wilvan G. Van Campen, WPRFMC; Mr. Kenji Ego, Hawaii State Fish and Game; Dr. Stanley Swerdloff, Hawaii State Marine Affairs Coordinator's Office; and Mr. Charles Yamamoto, Marine Fisheries Advisory Committee; to discuss fishery development projects.
- 23-26 - Lt. D. McConaghy traveled to Monterey, California to attend a workshop on satellite-derived sea surface temperature.
- 24 - Dr. Roy Mendelssohn departed Honolulu for the U.S. east coast to attend the Operations Research Society of America/The Institute of Management Sciences (ORSA/TIMS) meeting.
- 26 - Dr. Michael Adams, member of the WPRFMC Billfish Planning Team, departed Honolulu for Long Beach, California, to attend a meeting of the Pacific Council's Billfish Plan Development Team and Advisory Sub-panel.
- 26-27 - Dr. Douglas McLain, PEG, traveled to La Jolla to discuss a manuscript he is co-authoring with Dr. R.M. Laurs.
- 27 - Ed Ueber, Tiburon Laboratory, traveled to Portland to review the progress report on the economic inventory contract for the Pacific Fisheries Management Council.
- 27-28 - Dr. G. Sakagawa and Jim Squire were in Long Beach to attend a Billfish Management meeting.
- 28 - Director I. Barrett and Deputy Director J. Carr were at the Tiburon Laboratory to discuss administrative and scientific matters with the director and his staff.

PERSONNEL ACTIONS

- April 3 - Brian S. Joyo, Biological Aid (Microbiology), Temporary Appointment - Honolulu Laboratory
- 9 - Francine E. Yagawa, Data Transcriber, Extension of Temporary Appointment - Honolulu Laboratory
- Thomas Shay, Biological Technician, Reassignment - La Jolla Laboratory
- Dr. Geoffrey Moser, Supervisory Fishery Biologist, Promotion - La Jolla Laboratory
- Dale Powers, Biological Technician, Resignation - La Jolla Laboratory
- June Favorite, Physical Science Aid, EOD, Part Time - Pacific Environmental Group, Monterey
- 23 - James Coe, Supervisory Fishery Biologist, Promotion - La Jolla Laboratory
- Glenn R. Higashi, Biological Technician (Fisheries), Promotion - Honolulu Laboratory
- Robert L. Humphreys, Jr., Biological Technician (Fisheries), Promotion - Honolulu Laboratory
- Robert B. Moffitt, Biological Technician (Fisheries), Promotion - Honolulu Laboratory
- Darryl T. Tagami, Biological Technician (Fisheries), Promotion - Honolulu Laboratory
- Martina K. K. Queenth, Biological Aid (Fisheries), Conversion to Temporary Appointment - Honolulu Laboratory. Also Reassignment to Experimental Ecology of Tunas Task (Honolulu)
- Victor A. Honda, Biological Technician (Fisheries), Reassignment to Insular Resources Task - Honolulu Laboratory
- Richard Dyer, Computer Technician, Resignation - La Jolla Laboratory
- Harold Dorr, Biological Technician, Student Appointment - La Jolla Laboratory
- Charles Evans, Biological Technician, Resignation - La Jolla Laboratory

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